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the 45 per cent. has approximately the formula $C_2H_6O+3OH_2$ (=46 per cent.).

Some of the physical properties examined seem to be especially connected with each other; these are:—

1. Specific heat and heat produced by mixing; for by dividing the number of units of heat evolved by 5 grammes of any mixture by 3·411, the elevation of the specific heat of such mixture above the theoretical specific heat is obtained.
2. Boiling-point and capillary attraction; by dividing the depression of the capillary attraction by 3·6, the depression of the boiling-point is obtained.

Deville & Hoek have shown the specific gravity and index of refraction to be connected with each other (Ann. de Chim. et de Physique, 3rd ser. vol. v. Pogg. Ann. vol. cxii.).

Whether the relations thus established between the various physical properties of alcoholic mixtures hold good with other similar substances, or whether these mixtures form a singular exception, must be decided by further research.

March 18, 1869.

Dr. WILLIAM ALLEN MILLER, Treasurer and Vice-President, in the Chair.

The following communications were read:—

I. "Researches into the Chemical Constitution of Narcotine, and of its Products of Decomposition."—Part III. By A. MATTHIESSEN, F.R.S., Lecturer on Chemistry in St. Bartholomew's Hospital. Received February 18, 1869.

(Abstract.)

In this part the preparation is described of two new bases derived from narcotine.

1. *On the Action of Hydriodic Acid on Narcotine.*—When narcotine is heated with fuming hydriodic acid, iodide of methyl is evolved, and on investigating the residue it is found to consist of the iodide of a new base.

In two experiments made with 50 grms. of narcotine, 45·7 and 46·2 grms. of iodide of methyl, and in a third experiment with 100 grms. of narcotine, 91·8 grms. of iodide of methyl, were obtained, 51·5 grms. and 103·1 grms. being the theoretical quantity required for the following reaction:—

$$C_{22}H_{23}NO_7+3HI=C_{19}H_{17}NO_7+3CH_3I.$$

If the reaction

$$C_{22}H_{23}NO_7+2HI=C_{20}H_{19}NO_7+2CH_3I$$

took place, the theoretical quantity of iodide would only be 34·3 grms. and 68·7 respectively.

The endeavours to obtain the base in a state fit for analysis have been fruitless, owing to its oxidizing rapidly when exposed to the air; to establish its composition, the chloride was analyzed, and led to the following result:—

$$C_{19}H_{17}NO_7HCl.$$

The base itself is, when newly precipitated, nearly white, but as soon as it is exposed to the air it becomes almost black; it is soluble in carbonate of sodium, caustic soda, potash or ammonia, slightly soluble in hot alcohol, quite insoluble in ether, and nearly so in water. All endeavours to obtain it or its salts in a crystalline state have hitherto failed.

The base may be called normal narcotine, or, shorter, nornarcotine, as it contains, in all probability, normal meconin combined with cotarnimide.

2. *On the Action of Hydrochloric Acid on Narcotine.*—When narcotine is heated with hydrochloric acid for about two hours, chloride of methyl is evolved, and on examining the residue it will be found to contain the chloride of a new base. The reaction which takes place is simply that one atom of methyl in the narcotine is replaced by one of hydrogen; thus:—

$$C_{22}H_{23}NO_7+HCl=C_{21}H_{21}NO_7+CH_3Cl.$$

The pure base forms a white amorphous powder, almost insoluble in water and ether, very soluble in alcohol. Its salts, like those of the other bases derived from narcotine, are, as far as they have been prepared, amorphous. The base may be called dimethyl-normal-narcotine, or, shorter, dimethyl-nor-narcotine.

In the annexed Table the properties and reactions of the narcotine bases are given side by side.

Neither of the above bases has any marked physiological effects; for in working with them, as well as in taking grain doses, no ill effects have been observed. It is worthy of notice that the taste of the chlorides varies so markedly by the replacement of one atom of methyl by one of hydrogen.

	Form.	Solubility in			Concentrated Solution of Chloride.	Taste of Chloride.	Reactions of the Chlorides in solution with			
		Water.	Alcohol.	Ether.			$Pt\,Cl_4$*.	$K\,H\,O$.	$N\,H_4\,H\,O$.	$Na_2\,C\,O_3$.
Trimethyl-normal-narcotine (ordinary narcotine), $C_{22}\,H_{23}\,N\,O_7$.	White crystals.	Almost insoluble.	Soluble.	Soluble.	Not precipitated by H Cl. Solution in H Cl not precipitated by water.	Bitter.	Yellow precipitate.	Precipitate insoluble in excess.	Precipitate insoluble in excess.	Precipitate insoluble in excess.
Dimethyl-normal-narcotine, $C_{21}\,H_{21}\,N\,O_7$.	White, amorphous.	Almost insoluble.	Very soluble.	Slightly soluble.	Precipitated partially by H Cl. Solution in strong H Cl precipitated by water; the precipitated chloride is tarry.	Bitter.	Yellow precipitate.	Precipitate soluble in excess.	Precipitate slightly soluble in excess.	Precipitate insoluble in excess.
Methyl-normal-narcotine, $C_{20}\,H_{19}\,N\,O_7$.	White when freshly precipitated, sometimes brown; amorphous.	Almost insoluble.	Insoluble.	Insoluble.	Mostly precipitated by H Cl. Solution in strong H Cl precipitated by water; the precipitated chloride granular.	Astringent.	Yellow precipitate, slowly turning brown.	Precipitate soluble in excess.	Precipitate soluble in excess.	Precipitate soluble in excess.
Normal narcotine, $C_{19}\,H_{17}\,N\,O_7$.	White when freshly precipitated, turns brown immediately on exposure to air; amorphous.	Almost insoluble.	Insoluble.	Insoluble.	Almost wholly precipitated by H Cl. Solution in strong H Cl precipitated by water; the precipitated chloride granular.	Tasteless.	Yellow precipitate, immediately turning brown.	Precipitate soluble in excess.	Precipitate soluble in excess.	Precipitate soluble in excess.
Cotarnine, $C_{12}\,H_{13}\,N\,O_3$.	White, generally buff-colour, crystalline.	Almost insoluble.	Very soluble.	Very soluble.	Not precipitated by H Cl. Solution in H Cl not precipitated by water.	Bitter.	Yellow precipitate.	Precipitate slightly soluble in excess.	Precipitate soluble in excess.	Precipitate soluble in excess.

* All these precipitates decompose on boiling with excess of platinum chloride.